(d:) REMARKS

The Action mailed 14 January 2004 was directed to the present divisional application and is the first action on the merits. The Examiner objected to the Specification and to the drawings. Various elements of the claims were identified by the Examiner as not shown in the drawings or described in the claims. The Examiner further objected to the specification as not providing antecedent bases for some claim elements. The Examiner further objected to the Title of the Invention as not descriptive. The Examiner rejected claims 16-18 under the second paragraph of 35 U.S.C. 112 for indefiniteness and under 35 U.S.C. 103 for obviousness over various combinations of references. Claims 16-18 remain active.

By the foregoing amendment a new title "Vehicle Electrical System" has been proposed. In reviewing the objections to the drawings and specification counsel for the applicant noted a regretted, widespread, lack of consistency in terminology. Replacement drawings, amendments to the specification and amendments to the claims are offered directed to correcting this lack of consistency. By way of example, a voltage regulator used for controlling the charging of vehicle batteries was variously referred to as a charging regulator or a controllable voltage regulator. The latter term is intended to be the exclusive term for this device in the application as amended.

The more substantive amendments to the specification, which are not believed to constitute new matter, but for which identification of support is provided, are those occurring in the paragraphs beginning on page 6, line 19 and page 8, line 10. The first amendment of these amendments adds the following to the paragraph:

> The voltage level provided by controllable voltage regulator thus is a function of battery temperature, battery current voltage and battery history **43**. Battery history

may include anticipated run time of the vehicle engine **101**, which if short in duration leads to use of a higher charging current.

Support for the last sentence relating to battery history is found in Claim 14 as originally submitted and in the background section where driver behavior and the problems it causes for battery charging were discussed. The conclusion to the problem raised was in effect described in the claim, but omitted from the detailed description. The second change noted relates to substitution of the "State of Charge" for "loss" in discussing battery charge states. The term "State of Charge" is believed common enough in the art to be appropriately used in place of "loss" in the context of the paragraph. The specification was further objected to as not providing antecedent basis for an electrical system controller **including** data processing capacity (emphasis in original). The objected to language has been deleted, however, applicant notes that ESC 30 was repeatedly referred to as being programmed to accomplish various tasks by the specification.

The claims have been amended to conform to the terminology now used in the specification which is believed to address most of the concerns raised under 35 U.S.C. 112, second paragraph. Other amendments have been made to the claims directed to other specific objections. The objection to "dynamically setting a signal" has been dealt with by removing the word "dynamically". The term "algorithm" has also been deleted. The objection to the recitation of claim 18 of "a second battery set connected to provide power at a different voltage than the first battery set" was described as confusing since "both sets of batteries shar[e] the same charging regulator and input/output charge/discharge current lines and a common temperature sensor." The claim is directed to the specific embodiment illustrated in Fig. 3, where batteries 82, 84 and 86 are differently connected than the set of batteries comprising batteries 33 and 35. The specification clearly describes the batteries of the second set (i.e. 82, 84 and 86) as conventional 6 cell lead-acid batteries connected in series while batteries 33 and 35 are conventional 6 cell

batteries connected in parallel. Obviously, the second set will exhibit a voltage level about 3 times that of the first set.

All of the prior art rejections of claims 16-18, were based on the combination of Norton, US-P 4,723,079 in view of Farley, US-P 5,767,659.

The Norton reference, U.S. Pat. 4,723,079, teaches a motor vehicle electrical power supply which operates to supply power to at least one low voltage load circuit at a fixed regulated voltage and a high voltage load circuit at an adjustable regulated voltage where the voltage is adjusted responsive to the requirements of a load. ('079 patent, col. 2, lines 26-31.) A high voltage regulator 18 controls the output voltage of the generator ('079 patent, col. 3, lines 37-39). The illustrative embodiment provides power at three levels: high; intermediate; and low. ('079 patent, col. 3, lines 28-30.) The high voltage level circuit and load 16, such as a window heater, are supplied power directly from a generator 10. An intermediate voltage load circuit 22 is connected across the series connection of batteries 12 and 14 and is supplied with power at a current and voltage regulated by an intermediate voltage regulator 24. The loads on the intermediate voltage load circuit 22 include the starter motor, battery 14 and, under certain circumstances, high voltage load 23 (possibly including power steering and braking ('079 patent, col. 3, lines 39-44, col. 2, lines 40-45.) The low voltage load circuit is connected across battery 12 and is supplied with power the current and voltage of which are limited and regulated, respectively, by a low voltage regulator 28. Loads supported by this system include the vehicle's lights and the lower battery 12. Batteries 12 and 14 are connected in series with battery 12 being connected to ground. Presumably over voltages are allowed on the intermediate and low voltage systems to support recharging the batteries, but no discussion of recharging is provided.

Norton further states ('079 patent, col. 4, from line 14 to line 29, to Fig. 2 and to col.

5, lines 27-32) that it is the high voltage load circuit for which voltage is adjusted, depending in part on what the alternator is capable of supporting. The voltage levels (LV and IV in Fig. 2) supported by the storage batteries 12 and 14 are substantially fixed. Voltage levels on the high voltage circuit are controlled by adjusting the alternator excitation or field signal. ('079 patent, col. 4, lines 32-35.) Importantly, Norton states:

> non-critical load devices are automatically turned off in the event of generator failure. This is accomplished by energizing such non-critical load devices directly from the generator, excluding the system battery, so that the battery power is conserved for critical load devices such as the headlights or a power braking system . . . ('079 patent, col. 2, lines 32-39).

The "non-critical" devices which are energized from a circuit excluding the system battery are the same devices which are energized by the "adjustable regulated power supply" corresponding to high voltage regulator 18 in Fig. 1 of the '079 patent.

The Examiner refers to the intermediate and low voltage regulators 24 and 28 as charging regulators although the '079 reference does not directly discuss charging of the batteries 14 and 12. It is clear from the reference and the discussion above that both circuits include loads other than the batteries. Accordingly while the current reported by current sensor 42 might be "related" to the current supplied to battery 14 in the sense that such current as is supplied the battery is a component of what is sensed, the reported value is not the same as the current supplied to the battery since it also includes current supplied to load 22. Nor do conductors 48 and 53 report such current. Conductor 48 taps voltage at the positive terminal of upper battery 14 and conductor 53 taps the voltage appearing at the positive terminal of battery 12 (Fig. 1 of the '079 patent mistakenly shows conductor 53 connected to the upper terminal of battery 14 in contradiction to the description).

The independent claim of the present invention requires a "charging regulator" be used to charge the batteries. The charging regulator output is set by a program, executed

by the electrical system controller utilizing battery temperature, current discharged and other factors. The Examiner identifies a control circuit 78 of Norton with the electrical system controller, but this device, while used to regulate this output of generator 10 is responsive to total load on the system.

In addition, as may be seen with reference to Figs. 2 and 3 of the present application, devices such as lights are isolated from batteries so that the battery charging overvoltages do not shorten the devices' service life. See also the specification, page 2, lines 16-19. This consideration is totally absent from Norton as may be seen in the '079 patent, Fig. 1, where the low voltage load 26 (which is identified as including lights) is powered off the same circuit through which charging of battery 12 occurs. Thus when battery 12 is recharged the lights are necessarily exposed to any overcharge required to achieve charging. Claim 17 emphasizes the independence of other power utilizing circuits from the batteries.

The Norton reference nowhere states that adjustment of the output of voltage regulator 24 is made based on an estimate of the state of charge of battery 14 (or more accurately, batteries 12 and 14). Regarding the intermediate voltage level circuit to which battery 14 is connected, Norton says that voltage regulator 24 " . . . operate[s] with a duty cycle which is effective to regulate the voltage across the intermediate voltage load circuit at the intermediate voltage value." A voltage control signal is received over conductor 48 from the upper terminal of battery 14. A current sensed signal is received over conductor 52, however, the current sensed does not appear necessarily indicative of current through the battery, but rather current supplied to intermediate voltage circuit from voltage regulator 24 (the signal coming from a current sensor 42 coupled with an output terminal of the voltage regulator rather than with the battery terminal. A third control signal conductor 53 is described as providing a voltage control signal from the upper terminal of battery 12, but is shown in the figure as parallel to conductor 48. (See '079 patent, col. 4, line 59 to col. 5, line 4.) While it may be inferred that batteries 12 and 14 are recharged by generator 10

through the voltage regulators 24 and 28, nothing suggests the voltage regulators supply charging current to the batteries, adjusted based on battery temperature and estimated state of charge. In addition, an electrical system controller as described and shown in the present application corresponds to a programmable body computer, well understood by those skilled in the art of contemporary, network controlled vehicles. The "control circuit" **78** as described by Norton does not appear programmable. The circuit is described simply as being "responsive to the combination of the demand signals to set the regulator 18 so that it regulates the generator output at a voltage satisfying all load circuits", col. 5, line 67 to col. 6, line 2.

Norton was modified by Farley, US-P 5,767,659. Farley relates to the recharging of specialized batteries, e.g. Nickle-Cadmium and Metal Hydride batteries. Fast or high current recharging of these batteries can result in physical problems with the batteries, including high temperatures and pressures, particularly as the batteries approach a full charge. Farley teaches overcharge protection mechanisms which include, among other things, temperature sensors thermally coupled to the batteries, use by a central processing unit (38) of readings from the temperature sensors to control a battery charging current shunting transistor (304) in accordance with programming stored in memory. Farley appears to be a "smart" battery which may alternatively be inserted into a power utilizing device or a charging device. Power supplied by the battery does not appear to be used to support a system having positive power busses at different voltages. Farley operates by shunting charging current away from the cells when indication arises that the batteries are close to fully charged or overheating. If the teaching of Farley are to be incorporated into Norton, presumably a switchable current shunt (with power dissipating resistor) would be incorporated around batteries 12 and 14. Farley is directed to charging low capacity, low voltage batteries associated with products such as video camcorders and laptop computers. Shunting charging current around such a low capacity battery may be acceptable in such applications, but not in automotive applications. The shunting of

current would be detected by the Norton system as an increased load resulting in demands for increased output by generator 10, an undesirable and potentially self defeating result.

The remaining dependent claims add still further limitations further distinguishing the present invention over the cited reference. Applicant believes the Claims as amended are in condition for allowance and respectfully requests favorable action by the Examiner.

Respectfully submitted,

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CERTIFICATE OF FIRST CLASS MAILING UNDER 37 CFR 1.8 (a)

I hereby certify that this **AMENDMENT** is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Mail Stop Non-Fee Amendments, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on or before March 10, 2004.

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